STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
HIGH STRENGTH PRESTRESSED BEAMS

IM 029-3(82)84, PCEMS 3784
MINNEHAHA COUNTY

OCTOBER 28, 1998

The following specified revisions shall be made to Section 490 of the South Dakota Department of Transportation Standard Specifications for Roads and Bridges.

Delete the first paragraph of Section 490.2 B.3. and replace it with the following.

3. The Contractor shall submit a concrete job mix design for approval and produce a trial batch of 3-5 cubic yards for testing by the Department thirty working days prior to fabrication. The trial batch can be used anywhere by the Contractor. Adequate notice shall be given to the Department prior to batching the trial mix so testing can be scheduled. The mix design shall include all admixtures proposed for use and shall contain a minimum of 58 percent coarse aggregate by weight.

In lieu of an approved mix design and trial batch, the contractor may use the following mix proportions:

Cement Type II	630lb/Cu. Yd.
Fine Aggregate	1200lb/Cu. Yd.
Course Aggregate (quartzite)	1825lb/Cu. Yd.
Water	189lb/Cu. Yd.
Silica Fume	70lb/Cu. Yd.
Air	6.5% ±1.0%

The air-entraining agent MB-VR Standard (Master Builders) shall be used.

For informational purposes - Trial mixes used a high range water reducer (RHEOBUILD 1000 Master Builders) at 26.7oz/cwt of cementitious material. The trial mixes had a 7-day strength of 12280 psi and a 28 day strength of 14065 psi.

For informational purposes – Silica fume concrete mixes typically require more air entraining agent than normal mixes to get the desired air content. Due to rapid slump loss in silica fume concrete mixes, slump should be increased approximately 2 inches from the normal slump used. Mixing times may need to be increased and the volume of concrete mixed in truck mixers may need to be decreased to achieve good uniformity.

Add the following to Section 490.2 B.

4. Silica Fume shall conform to the Special Provision for Silica Fume.

Delete the first paragraph of 490.3 F and replace it with the following.

F. Concrete Cure: The beams shall be cured by low pressure steam or radiant heat with 100% humidity maintained within the curing enclosure until the concrete has gained sufficient strength for prestress transfer.

The Department will supply instrumentation for and monitor the humidity.

Delete section 490.5 and replace it with the following.

BASIS OF PAYMENT: Prestressed beams will be paid for at the contract unit price per each. Payment will be full compensation for furnishing and transporting the beams to the project site. Payment includes reinforcing bars, prestressing steel, and all other accessories embedded in the beam.

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STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
HIGH PERFORMANCE CONCRETE BRIDGE DECK

IM 029-3(82)84, PCEMS 3784
MINNEHAHA COUNTY

DECEMBER 12, 1998

The following specified revisions shall be made to Section 460 of the South Dakota Department of Transportation Standard Specifications for Roads and Bridges.

Change the following in Section 460.2.

J. Fly Ash: See the Special Provision for Fly Ash.

Add the following to Section 460.2.

K. Silica Fume: See the Special Provision for Silica Fume.

L. Evaporation Retardant: The evaporation retardant shall be one of the following or an approved alternate:

SIKAFILM Sika Corporation Aurora, Colorado (303)337-1713	E-CON L&M Construction Chemicals, Inc. Omaha, Nebraska (402)453-6600
CONFILM Master builders, Inc. Cleveland, Ohio (800)MBT-9990	FINISHING AID Symons Corporation Des Plaines, Illinois (847)298-3200

Delete the second, third and fourth paragraph of Section 460.3 A and replace it with the following.

The concrete job mix design is based on 4500 psi 28 day compressive design strength and shall consist of the following mix proportions:

Cement Type II	511 lb/Cu. Yd.
Fine Aggregate	1100 lb/Cu. Yd.
Course Aggregate (quartzite)	1725 lb/Cu. Yd.

Water	264 lb/Cu. Yd.
Fly Ash	118 lb/Cu. Yd.
Silica Fume	55 lb/Cu. Yd.
Air	6.5% ±1.0%
Slump	5 to 7 inches

The air-entraining agent MB-VR Standard (Master Builders) shall be used.

A mid range water reducer shall be used conforming to ASTM C494, Type A or D.

For informational purposes - Trial mixes used a mid range water reducer (Polyheed-997 Master Builders) at 8.0 oz/cwt of cement. The trial mixes had a 14-day compressive strength of 5135 psi and a 28 day strength of 6140 psi.

A test pour, with the above mix, shall be conducted a minimum of 30 days prior to the deck pour. The location for the test pour will be coordinated through the Engineer and will be on the project if possible. The test pour shall consist of an unreinforced slab 40’ wide, 36’ long, and 9” thick. The test pour shall be set up, placed, finished, and cured – including the use of fogging equipment – in the same manner the bridge deck will be done. An exception is that the last 10’ of the test pour shall not be fogged but instead shall have an evaporation retardant applied immediately behind the carpet drag on the finish machine. Following the initial application of the evaporation retardant, the test pour slab shall be given a grooved finish using a metal tine as per Section 460.3.O(4). Following the metal tine grooving, the evaporation retardant shall be reapplied. Application of the evaporation retardant shall be in accordance with the manufacturer's instructions. Re-application of the retardant is necessary whenever the fugitive dye in the retardant is no longer visible. The evaporation retardant shall be reapplied as necessary until the concrete is covered with wet burlap. Placing High Performance Concrete in the bridge deck will not be allowed until successful completion of a test pour. Successful completion is defined as achieving concrete compressive strengths in excess of the minimum specified and demonstrating a successful fogging and curing operation with minimal cracking of the test pour. If it is necessary to adjust mix design or procedures, the Engineer will order a second test pour which will be paid for at the unit price bid. The Contractor may be required to dispose of the test pour slab(s). If required, test pour slab(s) shall be

removed and disposed of on a site obtained by the Contractor and approved by the Engineer in accordance with the WASTE DISPOSAL NOTES found in the grading plans. Payment shall be at the unit price bid for Remove Test Slab.

For informational purposes – Silica fume concrete mixes typically require more air entraining agent than normal mixes to obtain the desired air content. Slump requirements are higher due to rapid slump loss in silica fume concrete mixes. Mixing times may need to be increased and the volume of concrete mixed in truck mixers may need to be decreased to achieve uniformity in the mix.

Add the following to Section 460.3.B

4. Fogging Equipment: Fogging equipment shall be capable of applying a fine fog (maximum average water droplet size no larger than 75 microns), NOT A SPRAY, over the entire exposed concrete surface from immediately behind the finish machine to the closest point at which wet burlap has been placed on the deck.

The manufacturer’s literature, equipment specifications, and operating instructions for the fogging equipment shall be submitted to the Office of Bridge Design for approval prior to use on the test pour.

5. Deck Grooving Equipment: Deck grooving shall be done with a mechanized multi-blade saw capable of sawing 1/8″ wide by 3/16″ deep grooves at 1″ spacing in the concrete deck.

Add the following to Section 460.3 N.

High Performance Bridge Decks shall be cured as follows:

As soon as the bridge deck concrete has been struck off and finished by the finish machine, it shall be given carpet drag finish with the carpet drag attached to the finish machine. Fogging with approved fogging equipment shall begin immediately behind the finish machine and shall continuously fog the entire exposed surface until wet burlap is applied. Fogging will be considered inadequate when the relative humidity is less than 85% within 6″ above the deck surface, in which case fogging must be immediately applied or the area of coverage increased. The Engineer will monitor relative humidity. Wet burlap shall be placed as soon as the concrete surface will support it without deformation. The

burlap shall be kept continuously and thoroughly wet with soaker hoses for not less than seven days after placing the concrete. Polyethylene sheeting shall be placed over the wet burlap and soaker hoses as soon as the concrete can be walked on without damaging it. Bridge deck grooving shall be sawed into the surface at least 14 days after the deck pour. Grooving shall be cut transverse to the centerline of the roadway, succeeding passes shall not overlap and it shall terminate one foot from the barrier curb.

Curing compound will not be allowed unless fogging is ineffective due to high winds or equipment malfunction. Therefore, the Contractor shall have curing compound and equipment to apply it on the job site and ready for use as a backup to fogging. Because wind can cause fogging to be ineffective, the Contractor shall attempt to pour the bridge deck when light winds are forecast. The Contractor will not be allowed to pour when winds are in excess of 20 mph at the start of the pour.

Change the first sentence under bridge deck finishing machine minimum requirements in Section 460.3 O.4. to the following:

The finishing machine shall be a self-propelled rotating cylinder type with two or more rotating steel cylinders and augers.

Add the following to Section 460.4.

METHOD OF MEASUREMENT: The test pour and high performance concrete bridge deck will be measured with neat line dimensions computed to the nearest 0.1 cubic yard. Bridge Deck Grooving will be measured to the nearest 0.1 square yard.

Add the following to Section 460.5.

BASIS OF PAYMENT: The test pour and high performance concrete bridge deck will be paid for at the contract price per cubic yard. Payment will be full compensation for all labor, equipment, tools, materials, and other items required to furnish, place, finish and cure the High Performance Concrete.

Bridge Deck Grooving will be paid for at the contract unit price per square yard. Payment will be full compensation for all labor, equipment, tools, materials, and other items required to groove the bridge deck.

Remove Test Pour will be paid for at the lump sum contract price. Payment will be full compensation for all labor, equipment, tools, materials, and other items required to remove the test pour slab.

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